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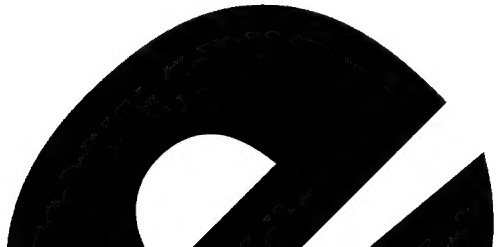

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DIRECTORATE OF
INTELLIGENCE

Intelligence Memorandum

Economic Impact Of The Aswan High Dam

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CENTRAL INTELLIGENCE AGENCY
Directorate of Intelligence
October 1971

INTELLIGENCE MEMORANDUM

ECONOMIC IMPACT OF THE ASWAN HIGH DAM

Introduction

1. Completion of the Aswan High Dam in mid-1970 culminated a quest for mastery of the Nile that began thousands of years ago. Gamal Abdul Nasir, who died before the dam was formally inaugurated, doubtless considered it the greatest economic achievement of his regime. While Egyptian authorities tend to exaggerate the dam's economic benefits, the foreign press has dwelt on alleged problems such as excessive seepage and ecological dangers. This memorandum attempts to bring together the available information on the dam's economic impact and to arrive at a balanced assessment of it.

Discussion

The Nile in Egyptian History

2. The Nile River is the source of almost all life in Egypt and was the wellspring of Egyptian civilization. The topsoil in the only arable regions, the Nile Valley and Delta, consists almost totally of silt deposits from the Nile. For thousands of years the annual Nile flood provided the only moisture except in scattered oases and coastal areas, and it largely determined the pattern and organization of human existence.

3. Efforts to exploit the Nile waters more fully and control the annual flood have underlain Egyptian technological advance since the dawn of recorded history. In ancient times, devices such as the counterbalanced dipper and the Archimedes screw, still used today, raised river water to irrigate garden plots during the low-water period. Early efforts to store Nile water were impressive. The world's first rockfill dam, still in existence, was

Note: This memorandum was prepared by the Office of Economic Research and coordinated within the Directorate of Intelligence.

built five thousand years ago by Amenemhet II to accumulate drinking and irrigation water in the Cairo area. The most significant achievement, however, was construction of dikes around fields to retain floodwater and silt. This system of basin irrigation remained the prevailing practice in most of Upper Egypt until the High Dam became operative.

4. Despite these early innovations, the annual crop cycle imposed by the Nile was not altered until Egypt's first modernizing ruler, Mohammed Ali Pasha, completed the Delta Barrage[1] just below Cairo in the 1830s. Rebuilt and heightened later in the century, the barrage raised the river sufficiently to provide water year around in the southern Delta region. The barrage permitted two crops to be raised each year, thereby offering opportunities for doubling output and vastly increasing the scope for commercial agriculture. Ali introduced cotton as the second crop in the Delta, initiating the transition from basic foodstuffs to high-yield commercial crops which continues today.

5. During Britain's domination of Egypt, which began in 1882, barrages were built on the Nile's Damietta and Rosetta branches in the Delta and upstream at Asyut and Naj Hammadi. This system provided perennial irrigation throughout the Delta and in the area between Asyut and Cairo now known informally as Middle Egypt (see the map). Cotton also was introduced as the second crop in Middle Egypt. The barrage at Naj Hammadi and another at Isna, built after the British left, increased the water available for basin irrigation and made some perennial irrigation possible in Upper Egypt. The first Aswan Dam, completed by the British in 1902 and now known as the Low Dam, was the first attempt to regulate the force of the annual Nile flood; it subsequently was raised in 1910 and 1938. Even so, these structures did not make maximum use of Nile water. Part of Upper Egypt still was without perennial irrigation and, on the average, 32 billion cubic meters of the total supply of 84 billion cubic meters of Nile water flowed unused to the sea each year.

High Dam Project – Construction, Specifications, and Costs

6. To use the wasted water, Egypt turned after World War II to the High Dam concept. Apart from building a large rock-fill dam that would produce ample water-storage capacity, the project embraced installation of power-generating equipment, expansion of the electrical transmission system, construction of canals and other perennial irrigation facilities in Upper Egypt and on reclaimed land elsewhere, and development and settlement of reclaimed land.

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1. A barrage is a low-level water-restraining device. The Nile barrages have a series of gates which may be opened to let the water flow freely during flood season.

7. Originally designed by West German and French engineers in the early 1950s and slated for financing with Western credits, the Aswan High Dam became the USSR's largest and most famous foreign aid project after the United States, the United Kingdom, and the International Bank for Reconstruction and Development (IBRD) withdrew their support in 1956. The first Soviet loan of $100 million to cover construction of coffer dams for diversion of the Nile was extended in 1958. An additional $225 million was extended in 1960 to complete the dam and construct power-generating facilities, and subsequently about $100 million was made available for land reclamation. These credits of some $425 million covered only the foreign exchange costs of the project, including salaries of Soviet engineers who supervised the project and were responsible for the installation and testing of Soviet equipment. Actual construction, which began in 1960, was done by Egyptian companies on contract to the High Dam Authority, and all domestic costs were borne by the Egyptians. Egyptian participation in the venture has raised the construction industry's capacity and reputation significantly.

8. Although construction difficulties were encountered in its initial stages, the dam was completed in mid-1970 -- about a year ahead of schedule. Water has been stored at the site since 1964, when the Nile began to back up behind two coffer dams built to keep the work area dry. The powerplant was inaugurated in January 1968, and construction work on the dam itself was completed several months later. All other work, including installation and testing of the last turbine, reportedly was finished by mid-1976 – nine and one-half years after construction had begun. On 15 January 1971, Gamal Nasir's birthday, the Egyptians and Russians officially celebrated completion of the High Dam project.

9. Unlike the Low Dam built by the British, the Aswan High Dam is a multi-year storage facility capable of impounding all unused Nile water in its vast reservoir, called Lake Nasir. It has eliminated the threat of disastrous floods, and the Nile's flow below Aswan now consists of virtually silt-free water deliberately released from the dam. One of the world's most impressive civil engineering feats, the High Dam is among the largest rockfill dams to be constructed, standing 364 feet above the river bed and measuring three and one-half miles across the top. The reservoir has a storage capacity of 105 million acre-feet.(2) Designed for both irrigation and power generation, the dam incorporates a number of relatively new features, including a very deep grout curtain below its base. Contrary to numerous rumors of excess seepage into and some leakage around the dam, it appears that the structure itself and its grout curtain are sound. Although the

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2. An acre-foot is a unit of volume of water equal to 43,560 cubic feet or 1,233.5 cubic meters.

Table 1

Egypt: Cost of Aswan High Dam Project

	Original Estimates		Estimated Actual (Minimum)	
	IBRD	Egyptian	Through FY 1970	Final
	Million US $			
Dam	316			
Power facilities	165	481	467	1,000 a/	1,000
Irrigation	297			
Reclamation	393	690	377	676	800
Miscellaneous	29		Included above	119	219
Idemnity for Sudan				35	35
Resettlement of Nubians				84	84
Barrages					100
Interest	120		Included above	Included above	Included above
Total cost	*1,320*		*844*	*1,795*	*2,019*
Foreign exchange costs	N.A.		N.A.	374	425
Local costs	N.A.		N.A.	1,421	1,594
	Percent				
Total cost as percent of 1960 GNP	45		29	61	69
Local costs as percent of savings in 1961-70				27	

a. *Total budget allocations for the High Dam Authority.*

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Table 2

Egypt: Additions to GNP Attributable to the Aswan High Dam

Source of Benefits	Original Egyptian Estimates for FY 1971	Estimated Actual FY 1970	Probable Eventual Maximum
	Million US $		
Reclamation and perennial irrigation	233 a/	81	162
Other agricultural sector benefits	129	50	100
Electric power	230	56	125
Flood protection	23	23	23
Navigation	12	12	12
Total	*627*	*222*	*422*
	Percent of 1960 GNP		
	21	7-1/2	14

a. Estimate based on revised rather than original Egyptian statements about anticipated gains.

reservoir will eventually silt in, even the most conservative estimates indicate the dam will give at least 200 years of service.

10. The cost of building the dam and implementing associated projects has vastly exceeded original estimates. According to budget data, at least $1 billion has been allocated thus far to the High Dam Authority, the agency responsible for building the dam and the associated electric power facilities. These reported figures almost certainly understate the actual costs to date. In addition, some $800 million has been spent on agricultural projects and other matters associated with the dam, and an estimated $200 million more will be spent on land reclamation and to counteract scouring of the riverbed by siltless water from Aswan.(3) The eventual total cost of the dam and related projects thus probably will approximate $2 billion, which is more than double Egyptian estimates made in 1956 (see Table 1). By and large, it is local currency costs that were underestimated. Amounting to about $1.4 billion so far, these costs absorbed a minimum of 27% of domestic savings during the past decade.

Overall Impact on Output – Expected and Actual

11. The High Dam has significantly increased Egypt's gross national product (GNP) and promises further gains, but the ultimate benefits will not be nearly so large as the government expected. By 1971, when all associated projects were scheduled for completion, the Egyptians anticipated benefits from the dam would increase the GNP by $627 million – the equivalent of 21% of 1960 GNP. By 1970, only a little more than a third of the estimated planned gain had been realized (see Table 2). The minor gains anticipated from improved navigation and flood control probably have been realized fully. But the two major programs, expansion of the irrigated area and electric power output, so far are yielding only a fraction of anticipated returns. Even when the reservoir is filled and all associated programs have been carried out fully, the dam's annual contribution to GNP is not expected to exceed some $422 million -- about 14% of 1960 GNP, or two-thirds of our estimate of Nasir's goal. This ultimate maximum gain possibly will be realized by 1975.

12. Egyptian expectations cannot be realized fully, because (a) that part of the Nile's flow available to Egypt is insufficient to satisfy both

3. Thus far, scour (river bed and bank erosion from fast moving, siltless water) has not accelerated seriously, but the turbines have not yet functioned with a full head of water. When they do, increased scour may imperil existing barrages. Because incapacitation of a single barrage would deprive a large area of water, Egypt contemplates construction of at least three new barrages to reduce the rate of flow and partially compensate for the lack of silt.

irrigation and electric power requirements and (b) lack of land suitable for irrigation precludes achieving the agricultural goal in any event. When the first Egyptian estimates of benefits from the Aswan project were made, studies of water requirements had not been completed nor had riparian rights to Nile water been settled. The IBRD's early endorsement of the project contained the important stipulation that at least 12 billion cubic meters of water saved by the dam be made available to Egypt each year. A 1959 agreement, however, authorized Sudan to take 14.5 billion cubic meters of the annual increment of 22 billion cubic meters expected after allowing for evaporation of 10 billion cubic meters from the reservoir. Egypt thus stands to receive a maximum of only 7.5 billion cubic meters of water in addition to its average pre-dam supply of 48.0 billion cubic meters annually (see Table 3).(4)

Table 3

Distribution of Nile Water

Billion Cubic Meters Per Year

	Total	Used by Egypt	Used by Sudan	Loss
Pre-dam allocation of average annual flow at Aswan	84	48.0	4.0	32
Gains from dam when reservoir is filled	22	7.5	14.5	--
Post-dam allocation	84	55.5	18.5	10 a/

a. Evaporation losses only. Until the bottom of Lake Nasir "silts in", additional losses from seepage will occur, reducing the net availability of water below the 74 billion cubic meters indicated here.

4. *The Egyptian-Sudanese agreement included a plan for increasing the flow of the Nile at Aswan by capturing water which escapes into the swamps of Bahr al-Jebel, Bhar ar-Zaraf, and Bahr al-Ghazal. Subsequent investigations have shown that the project is far more complex than originally supposed, and it probably will not be undertaken.*

13. As early as 1966, the Ford Foundation-sponsored Aswan Regional Development Committee completed water-use models showing that Egypt's goals for irrigation and power production can be only partially achieved. This study indicates that, if water release patterns were based solely on crop needs, the water supply would permit some 940,000 acres of land to be reclaimed through irrigation (assuming that the land is available) but that less than one-third of the power-generation goal could be reached. According to soil studies by the UN Food and Agriculture Organization, however, Egypt did not have that much potential arable land available at the project's outset. These studies estimated that, even if the poorest-quality reclaimable land were brought into use, the cultivated area could be expanded only by about 800,000 acres -- or 20% less than planned. On the other hand, generation of the full 10 billion kilowatt-hours (kwh) of power originally planned would entail a water release pattern forcing land already cultivated to be deprived of water.(5) According to the Development Committee's study, Egypt would maximize its return from the Aswan Dam by producing only about 5 billion kwh of electric power, which would be consistent with an effective water supply to agriculture of about 52 billion cubic meters and the corresponding reclamation of some 450,000 acres of land. The estimated effect of alternative water release patterns on the electric power and irrigation programs is shown in Table 4.

14. Although the High Dam has not created ecological problems as serious as some observers have charged, its construction has brought economic losses as well as gains. These losses derive largely from the settling in Lake Nasir of the rich silt traditionally borne by the Nile. To date, the main impact has been on the fishing industry. Egypt's Mediterranean catch, which once averaged 35,000-40,000 tons annually, has shrunk to 20,000 tons or less, largely because the loss of plankton nourished by the silt has eliminated the sardine population in Egyptian waters. Fishing in Lake Nasir may in time at least partly offset the loss of saltwater fish, but only the most optimistic estimates place the eventual catch as high as 15,000-20,000 tons. Lack of continuing silt deposits at the mouth of

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5. Theoretically, the conflict between water needs for power and irrigation could be at least partly resolved by using water more efficiently in agriculture. Given water control and distribution practices in use elsewhere, Egyptian irrigation water use per acre probably could be cut by 30% to 50%. Adoption of such techniques as sprinkler distribution and water recycling, however, would be extremely costly and would require a massive peasant training program running over many years. No consideration is being given to such projects so far as is known, and calculations made herein assume that they will not be introduced for many years.

Table 4

Alternative Uses of Nile Water Available to Egypt

Assumed Level of Electric Power Production at Aswan (Billion Kwh)	Corresponding Amount of Water Available for Agriculture When Needed (Billion Cubic Meters)	Corresponding Amount of New Land That Could Be Placed Under Irrigation (Thousand Acres)
3.1	55.5	938 a/
3.2	55.1	888 a/
3.7	54.6	825 a/
5.4	51.6	450
6.5	49.1	138
8.4 - 10.0	43.3 - 30.5	0

a. If this much potentially arable land were available, which is not believed to be the case.

the river also has contributed to a serious erosion problem. Commercial fertilizer requirements and salination and drainage difficulties, already large in perennially irrigated areas of Lower and Middle Egypt, will be somewhat increased in Upper Egypt by the change to perennial irrigation.

Progress of the Agricultural Program

15. The High Dam project was originally expected to add at least 30% to the 1960 value of agricultural output, mainly by enlarging the effective crop area through reclamation and increased double cropping on land already being cultivated. To achieve this goal, the government planned to reclaim about 1 million acres of land, largely in Middle and Lower Egypt, and to convert 700,000-900,000 acres in Upper Egypt from basin to perennial irrigation. These two programs were expected to expand both the effective crop area[6] and agricultural output by 25%. More regular availability of water was expected to provide some additional output gains on lands already under perennial irrigation and to permit transfer of the corn crop to the more hospitable summer season, thus increasing yields. Also, the increased water supply was supposed to permit a larger share of land to be used for high-value crops requiring a lot of water, such as rice.

16. Although land reclamation was Nasir's pet project and initially was pushed very hard, accomplishments to date have fallen far short of the goal. During 1961-65 an average of about 90,000 acres to be irrigated with Nile water were reclaimed annually according to Egyptian statistics,[7] compared with a total of 74,000 acres during 1952-60. Subsequently, however, the program faltered. Since 1965, an average of about 42,000 acres has been reclaimed annually, for an official total of some 660,000 acres – or two-thirds of the goal. Thus far, the program has expanded the effective crop area by no more than 12%, or little less than one-half of the original goal. Moreover, the rise in agricultural output attributable to the Aswan Dam land reclamation program is considerably smaller than the 12% gain in effective crop area because much of the reclaimed land is not

6. Because of double cropping, the effective crop area of lands under perennial irrigation is considered to be twice the actual land area. Thus, reclaiming an acre of land through perennial irrigation results in two acres of effective crop area, and introducing perennial irrigation to one acre already being cultivated adds one acre of effective crop area because of the extra crop obtained.

7. The official data include all land that has been leveled and provided with canals and drainage ditches, even though it may not yet be irrigated and as much as 11 years may be required to build up its fertility and make it fully productive.

yet fully productive. Of the 660,000 acres of land irrigated with Nile water which is officially regarded as reclaimed since 1960, only about 225,000 acres have been brought to full productivity; the balance is still under development. Annual output from all land reclaimed since 1960 probably equals some 6%-8% of 1960 output.

17. Mounting costs and growing doubts about the program's viability are the main reasons for the sharp decline in land reclamation. Egyptian authorities estimate that full development of the relativeiy fertile lands reclaimed since 1952 has cost an average of $240 per acre and has taken between six and nine years. The government says that the remaining, less suitable land will require up to 11 years to reach full production after the basic work is done, with costs rising accordingly. Some reclamation work is continuing under Soviet financing, but no other funds for land reclamation were included in the budget of the 1971-75 economic plan.

18. Egypt has converted land in Upper Egypt from basin to perennial irrigation more or less on schedule, but thus far the region's output of most crops has fallen. Although in principle the transition to perennial irrigation should permit an approximate doubling of harvests, gains may be slow to appear and in any case may never reach that level. For one thing, perennial irrigation is conducive to the spread of the debilitating disease schistosomiasis, which -- if endemic -- lowers worker productivity by perhaps one-third. Moreover, agricultural activities have been upset by construction of hundreds of miles of canals, and even after the work is complete, it takes the farmers many years to fully adopt new crop techniques.

19. In addition, much of the gain anticipated from a changed crop mix has failed to materialize, chiefly because world rice prices have fallen sharply. When work on the dam began, the export value of an acre's output of rice was greater than that of most other Egyptian crops. The government thus encouraged rice production with a system of bonuses and discouraged domestic consumption with high retail prices and penalties for "excessive" on-farm consumption. Falling international rice prices have at least temporarily eroded hope for gains from the shifting of some crop land to rice growing. Surplus rice stocks have accumulated despite reduced domestic retail prices and a government-enforced reduction in the planted area. With its original crop plans in disarray, the government now is stressing growing vegetables and other high-value crops. The potential payoff for these efforts is uncertain, however, and in any case will not be realized fully for some years.

20. Thus far, the one clear success resulting from year-round water availability has derived from shifting the corn crop from fall to summer harvesting. Even though corn acreage has been reduced, output has soared.

Hybrid seed has been introduced on a small scale, but increased yields are due largely to the change in season. By 1969, 78% of the crop was harvested in the summer in contrast to 8% in 1960.

21. The agricultural programs associated with the High Dam have brought annual output gains estimated at 4% of GNP and 16% of agricultural production in 1960. Only a little more than half of this increment has resulted from land reclamation and conversion from basin to perennial irrigation. The balance reflects primarily increased crop yields on previousiy cultivated land during the traditionally arid summer months. The ultimate agricultural gains deriving from the High Dam are expected to fall far short of the original goals, which are still being publicized by the Egyptians. A total gain in agricultural output equal to 21% of the 1960 level seems likely, but this improvement probably will not be achieved before 1975 or 1980, and the total gain thus is spread over a 15-20 year period. With population growing at 3% annually, it is clear that the Aswan project has not raised per capital agricultural output thus far and cannot be expected to do so in the future.

22. Perhaps because of disappointment over the agricultural benefits arising from the Aswan Dam, Egypt is now turning to other means to increase output. Recently, for example, an IBRD-sponsored program of installing drain tiles in certain areas has begun. It is estimated that extension of such a program to all areas afflicted with water-logging and salination could eventually increase output as much as 30% -- the gain once contemplated for dam-associated programs. The cost of installing drainage facilities is expected to be less than $100 per acre, whereas more than $300 would be required to raise output to an equivalent amount by irrigating new land.

Benefits of the Hydroelectric Program

23. All High Dam power facilities have been completed ahead of schedule. The 12 turbines have been installed and tested, giving the plant an installed capacity of 2,100 megawatts (mw), or more than twice the national total in 1960. With this capacity, the Aswan plant can produce 10 billion kwh of power yearly. Two 500-kilovolt trunk lines to Cairo have been completed, and initial transmission problems, stemming mainly from poor insulators, apparently have been solved. Also, the damage inflicted on a main transformer station in 1968 by Israeli commandos has been repaired, and the Aswan plant is fully integrated with the power network in Lower Egypt.

24. Power output at Aswan, however, almost certainly will never reach much more than half of the plant's theoretical capacity, because of limited

water supplies and the differing seasonal water-use patterns for irrigation and power production. Agricultural demand for water in the summer far exceeds the amount needed to meet the comparatively low summer demand for electric power. Heavy summer irrigation use, however, will leave insufficient water under Egyptian control to permit hydroelectric power production at full capacity in the winter. Technical studies indicate that a maximum annual output of 5 billion kwh appears to be all that can be sustained due to fluctuations in Nile flows.

25. Since it will take some time for power demand to catch up with Egypt's considerably increased production capacity, the Aswan plant thus far is producing much less than 5 billion kwh annually. During 1970, with all equipment in place, the plant produced only about 3.2 billion kwh of power, or about one-third of the amount originally planned for 1971. Moreover, 1.2 billion kwh of the 1970 output merely replaced power formerly produced in other plants, mainly other hydropower facilities. Consequently, although value-added in power production at Aswan in 1970 equaled about 3% of 1960 GNP, the power sector's net contribution approximated only 2% of 1960 GNP because of the displacement of production at other facilities.

26. Originally the Egyptians had expected to absorb all of the capacity of the Aswan plant by reducing thermal plant production, but, in fact, thermal output has remained fairly constant for the past three years. Since the High Dam was begun, Egypt has constructed modern thermal plants with some 800 mw of capacity. Cost factors dictate that these large thermal plants be operated near full capacity. Hence these units constitute the Egyptian power base, with the more flexible High Dam hydroelectric powerplant being reserved in part for peak loads. Some older, smaller thermal plants also have been kept on stream, possibly because of an interest in converting a domestic fuel surplus to energy. In sharp contrast to 15 years ago when the Aswan powerplant was planned, Egypt now has sizable fuel reserves that are not suitable for export. The heavy crude oil produced onshore in the Suez area has been difficult to market since the specially designed Suez refineries were destroyed, but it has been used successfully in thermal generating plants after minimal processing. Gas supplies also are available in newly discovered fields in the Delta area. These deposits are too small and widely separated to justify liquefaction for export, but they offer a sizable supply for domestic use.

27. Although the Egyptians still claim that the Aswan powerplant eventually will produce 10 billion kwh of electricity annually, continued construction of thermal plants suggests that the power ministry is aware of the water supply constraint. Pending a substantial increase in power demand, Egypt does not even need all of the 5 billion-5.5 billion kwh that can be produced annually while allocating a reasonable water supply to

agriculture. Egypt is considering several plans to utilize Aswan capacity more fully, including construction at Aswan of such heavy energy-users as a phosphoric complex and aluminum and ferroalloy plants. Locating these installations near the dam would minimize electrical transmission losses, but Aswan's distance from raw materials and prospective markets and the high investment costs involved probably will cause the projects to be delayed or relocated near other power sources. A rural electrification scheme, now under way, is a more likely choice, since it is less costly and may eventually result in more closely synchronized demand patterns for irrigation water and power. Either of these schemes, along with normal demand increases, should absorb the remaining Aswan capacity up to the 5 billion-5.5 billion kwh limit by 1975 or a little later, depending on completion dates.

Effects on the Balance of Payments

28. Despite its size, the Aswan project has not materially hurt the Egyptian balance of payments. The three Soviet credits covered virtually all of the project's foreign exchange requirements, including the cost of technical services, imported power generating and transmission equipment, and some imported equipment for land reclamation. Egypt is not being seriously burdened by payments on the credits, most of which were extended for 12 years with interest at the very low rate of 2-1/2%. Repayments to the USSR constituted only a small net drain during the first half of the 1960s, and increased export earnings derived from crops grown on newly reclaimed land have largely offset the modest debt service payments in recent years. During 1965-70, these export earnings amounted to an estimated $126 million, compared with debt service payments of $113 million (see Table 5). Annual debt servicing obligations probably will not increase much beyond the estimated $41 million paid last year, and some further export gains attributable to the project are in prospect.

Appraisal of the Project

29. Although it is moot whether the project constitutes the best use of the funds spent, the Aswan Dam project unquestionably is and will continue to be economically beneficial to Egypt. The project has been expensive and is taking considerable time to complete, as is usually the case with large hydroelectric developments. But Egypt now has a valuable asset with a long life and low operating costs. Aswan's estimated GNP contribution of $222 million last year amounts to a 12-1/2% return on the project's cost to date of $1.8 billion – and to a 16% return on Egypt's own outlays of $1.4 billion in local currency costs and debt service payments. In four or five years, when the Aswan powerplant is generating its practical maximum of about 5 billion kwh annually, when all reclaimed land is fully productive, and when Upper Egypt adapts to perennial irrigation, a GNP increment amounting to some 20% of $2.0 billion in local

Table 5

Egypt: Estimated Balance of Payment Impact of Aswan High Dam by Calendar Year

Million US $

	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970
Debt service for:										
Dam stage I										
Principal				6.3	8.5	8.5	8.5	8.5	8.5	8.5
Interest	0.1	0.4	1.2	2.5	2.3	2.1	1.9	1.7	1.5	1.3
Dam stage II										
Principal										18.8
Interest			0.1	0.9	1.6	2.4	3.2	4.0	4.8	5.7
Land reclamation										
Principal and interest						Negl.	Negl.	1.0	3.0	7.0
Total	*0.1*	*0.4*	*1.3*	*9.7*	*12.4*	*13.0*	*13.6*	*15.2*	*17.8*	*41.3*
Estimated export earnings attributable to the dam					6.0	12.0	18.0	24.0	30.0	36.0

costs and payments on Soviet credits will be realized. Even so, the wisdom of concentrating one-third of domestic saving and most of available foreign aid on a slow growth project is questionable. Since 1960, GNP has grown 50%, but mainly as a result of other investments.

30. Since 1967, value-added in various production activities associated with the Aswan project has begun to exceed its labor and capital costs, and small net profits have been earned. For FY 1970, labor costs are estimated at about $34 million and capital costs (consisting of debt servicing payments plus interest and amortization on local costs) at $143 million, which leaves a profit of some $45 million -- or about 3% of Egyptian investment in the project. By FY 1975, it is believed that the profit will reach some $200 million, or nearly 10% of the project's cost to Egypt by that time (see Table 6).

31. Egyptian authorities were well aware that equivalent gains in output could have been achieved more quickly and more cheaply by other means. A series of low dams, similar to the barrages now contemplated, was suggested by Egyptian engineers as a more economical means of achieving up to 2,000 mw of additional generating capacity. US and World Bank agricultural experts had long recommended improved drainage, introduction of hybrid seeds, and other such low-cost alternatives to land reclamation as a means of increasing agricultural output. In other areas, most notably the once efficient cotton textile industry, investment was needed to forestall an output decline. Implementation of these and other alternatives has been postponed rather than precluded by the High Dam project.

32. The decision to concentrate Egyptian savings and energies on the Aswan project for a decade was heavily based on non-economic factors. Nasir undoubtedly believed that a project of considerable symbolic appeal was needed to mobilize the population behind the government's economic goals. He also apparently felt that the East and West would be more easily persuaded to bid against each other for a project of this scope. In the absence of detailed technical studies, all of which had not yet been begun, such considerations easily overrode the generalized economic skepticism voiced by the World Bank and some, at least, of Nasir's own advisors.

Conclusions

33. The Aswan High Dam is making an appreciable contribution to Egyptian GNP, and this contribution will increase during the next five to ten years. But both the returns to date and those which can be expected eventually are well below what the planners had anticipated. Additions to output in 1970 that are attributable to the dam equaled only an estimated

Table 6

Egypt: Estimated GNP Increment and Profits Provided by the Aswan High Dam Project by Fiscal Year a/

Million US $

	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975
GNP increment b/	19	60	100	141	181	222	262	302	342	383	422
Labor and capital costs	59	87	110	129	150	177	194	208	212	215	217
Wages	9	18	23	25	30	34	36	40	42	44	46
Soviet debt service	11	13	13	14	17	30	40	47	47	47	47
Amortization of local costs (50 years)	7	11	15	20	24	26	29	30	31	31	31
Interests on local costs	32	45	59	70	79	87	89	91	92	93	93
Profit or loss	-40	-27	-10	12	31	45	68	94	130	168	205

a. The Egyptian fiscal year runs from 1 July of the previous year to 30 June of the stated year.
b. Dam did not retain water until late 1964; hence no income occurred until FY 1965.

8% of GNP in 1960, when major work on the dam was started; additions in 1970 amounting to 21% of 1960's GNP had been expected. The maximum eventual annual contribution of the dam is anticipated to be about 14% of 1960's GNP, or two-thirds of the gain that it is estimated was supposed to be realized by 1971.

34. The principal limiting factors on the High Dam's contribution to Egyptian output are a shortage of land suitable for reclamation, the high cost and long time required to bring reclaimed land to full productivity, and an inadequate water supply to meet power and irrigation goals simultaneously. The last limitation arises in part from the allocation in a 1959 agreement of more water to Sudan than was originally foreseen and in part from differences in the seasonal demand pattern of agriculture and the hydroelectric plant for the water. Irrigation requires very heavy use of water during summer months, while power generation needs peak during the winter. Ecological problems created by the dam, most of which were anticipated, have not seriously harmed the economy, although a few minor industries have been damaged.

35. Production gains from the High Dam and associated projects also are not materializing nearly as fast as the Egyptians expected. Originally, the full planned benefits were anticipated by 1970. In fact, the more moderate gains that now seem likely probably will not materialze before 1976, and full use of the power potential (which is much less than once thought) may come even later. Bringing new land into full production takes considerable time, conversion of basin irrigation to perennial irrigation disrupts traditional farming as producing land is subdivided and canals are built, and much time is needed to teach farmers to cultivate new crops. Potential power production will not be fully realized until new consuming facilities are constructed. Major consuming plants near Aswan are only in the planning stage, and a large planned rural electrification program is barely beginning.

36. The dam is, nonetheless, a viable project. Eventually the contribution to GNP should equal as much as 20% of total investment. Moreover the dam and associated projects now appear to be providing returns that at least offset the cost of operation, repayment of foreign loans, and amortization of domestic loans, and when all facilities are fully operational and foreign loans repaid, it should provide a net profit of up to 10% on the initial investment.

Major Irrigation Features of the Nile